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SAPC-1352

Informal Monthly Progress Report No. 4

For The Period

16 April 1955 through 15 May 1955

Contract No. A-101

[redacted] 25X1A

Copy 1 of 7

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Approved For Release 2000/09/01 : CIA-RDP81B00878R000200120027-3

1.0 This report reviews the progress on System No. 1 for the period of 16 April 1955 to 15 May 1955, inclusive.

2.0 ANTENNA

The waveguide dipole feed at X-band was matched to the dish and gave good performance over the band. The cutler feed was abandoned in favor of the simpler dipole design.

Free space pattern measurements and pattern measurements with the antennas installed in a full-scale mock-up of the nose of the aircraft have been made for S and X frequency bands. The major effect of the mock-up was a small increase in the magnetic plane side lobe response at the high frequency end of the S band.

3.0 INFORMATION AMPLIFIERS

Recent activity in amplifier development has been directed at increasing the dynamic range of the amplifier from 33 db to approximately 46 db to equal the recording range of the tape. To obtain this added dynamic range, the plate-voltage supply was increased from 28 volts to values of 250 volts and 125 volts. These d-c potentials are obtained from a vibrator-type power supply operating from a 28 volts d-c source. The high-voltage supply weighs about one pound.

A pulse transformer is to be added between the last video stage and the cathode follower driving the pulse-stretching circuit to invert the phase and step-up the pulse amplitude. This increases the amplification by a factor of two or three with very little increase in the power requirements. A specially designed transformer will be delivered in the near future.

A pulse-width limiting circuit was added to the information amplifier to make the amplifier-output amplitude independent of input-pulse widths. This circuit consists of one cathode follower and a 0.25 microsecond delay line. This change and the new power supply are indicated on the revised block diagram, figure 1.

4.0 INFORMATION RECORDER

Parts are machined or are on order for four prototype recorders. A fibreglas cover has been received. The base plate and gear assemblies are being assembled. All parts will be received by the second week of the next progress period. Some parts will be hand fitted until proper tolerances can be determined for the production model. Test tapes, dubbing tapes, and the 1/2 mil Mylar tapes are either on order or have been received.

The circuit design and physical layout of the bias oscillator, timing oscillator, and monitor amplifiers are about 90% complete.

The bias oscillator uses a silicon transistor and operates at a frequency of approximately 20 kc.

The timing oscillator is a silicon-transistor, crystal-controlled oscillator supplied by Hill Electronics. The packaged unit operates at 1 kc and weighs 3 1/2 oz.

The monitor amplifiers are silicon-transistor amplifiers. The required gain and noise figure will be determined during the next progress period after more complete tests are made using the prototype recorder.

Tests were made to check the effectiveness of the motor-speed governor as the supply voltage, the load, and the temperature were varied. The initial speeds of five motors operating at rated voltage, room temperature, and with no load varied from motor to motor to within 3.2% of 7000 rpm. The following table shows the effects of supply voltage, temperature, and load on motor speed.

Conditions	Percentage Change In Speed
No Load, Room Temperature, Supply Voltage Varied From 23 volts to 30 volts.....	0.5%
No Load, Constant Supply Voltage, Temperature Raised from Room Temperature to 80°C....	2.5%
Constant Voltage, Room Temperature, Load Varied From Zero to Full Load (0.3 in-oz).....	0.6%

A tape-transport mock-up using the capstan-drive motor and gear box has revealed flutter on the order of 4% as measured on a 3-kc carrier frequency. The nature and causes of this flutter are being determined. The noise induced into the reading heads by the motor magnetic fields has been reduced to a usable value by double mu-metal shielding of the heads and capstan drive motor, and single shielding of the reel-drive motors.

The production design of the recorder was started during this progress period. This design will eliminate use of the magazine and will result in repositioning a number of the recorder components. The final design for the recorder will offer the following advantages over the present magazine type:

A. The recorder will become a single-unit structure and will therefore exhibit greater rigidity and more advantageous placement of certain component parts.

B. The recorder may be loaded or unloaded from one side only.

C. Recorder tape-threading will be simplified.

D. Noise pickup by the reproducer heads from the driving motors will be reduced greatly.

E. Greater freedom in choice of recorder mounting will be provided.

F. Slightly higher tape speed (2 1/4 inches per second vs. 1 7/8 inches per second) will extend proportionately the recorder frequency range.

G. The operator may observe the tape motion to be certain the tape is threading and moving correctly.

5.0 TEST EQUIPMENT

All circuits are designed and preliminary tests have been made on a breadboard model. Design of the chassis, case, and front panel were started during this period along with the layout and wiring of a prototype unit.

6.0 DUBBING EQUIPMENT

A visit was made to Bing Crosby Enterprises to observe the square-wave response of an Ampex 350 recorder operating with a tape speed of 7 1/4 inches per second. Non-linear phase response caused considerable distortion of the reproduced pulse. The dubbing amplifiers will be modified so that the amplitude of the output is proportional to the amplitude of the pulse input. Four of these recorders have been ordered. Delivery of the first unit is promised for early in June.

7.0 CONCLUSION

Flight testing is scheduled for mid-June and a large part of the next interval will be devoted to assembling and testing the two complete systems and the spare antenna assemblies which are to be used for these test flights.

Design of the production model of the system will be started during the next reporting interval.

A total of 5565 man-hours were expended during this reporting period.

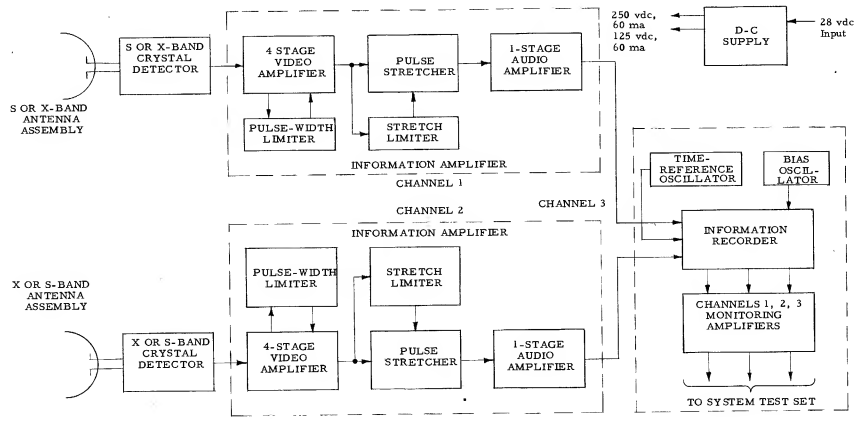

FIG. 1 AIRBORNE MONITORING SYSTEM, BLOCK DIAGRAM, REVISION NO. 1